Total No. of Questions : 7]

SEAT No. :

P4764

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[5060]-586

M.E. (Mechanical Design Engineering)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Design a four link mechanism when the motion of the input and the output links are governed by a function $y = x^2$, and x varies from 0 to 2 with an interval of 1. Assume θ to vary from 50 to 150 degrees and φ from 80 to 160 degrees. Use graphical method for four positions. **[10]**

Q2) a) Explain how to convert a low degree complex mechanisms to a simple mechanism with examples? **[4]**

b) Explain auxiliary point method with neat sketches. **[6]**

Q3) a) Derive Freudenstein's equation for slider crank mechanism. **[6]**

b) For the beam element, write element and stiffens mass matrices. Explain the terms used for matrix representation. **[4]**

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Q4) Following data is related to a four bar mechanism where link 2 is crank and link 4 is output link. **[10]**

$\theta_2 = 60^\circ$ $\Phi_4 = 90^\circ$

$\omega_2 = 3$ rad/sec $\alpha_2 = -1 \text{rad/sec}^2$

$\omega_4 = 3$ rad/sec $\alpha_4 = -1 \text{rad/sec}^2$

Determine ratios of link lengths.

Q5) Find the inflection circle for the motion of coupler of slider crank mechanism as shown in **Fig. 01**. Also determine instantaneous radius of curvature of path of coupler point D OA = 50 mm, AB = 80 mm, AC = 50 mm and CD = 25 mm. **[10]**

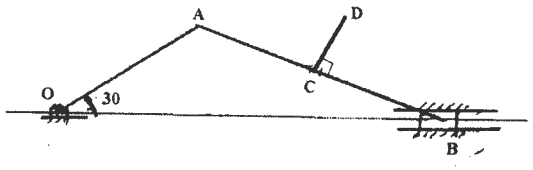

Fig. 01

Q6) a) Explain with neat sketch Denavit-Hartenberg parameters for the Hooke's Joint. **[5]**

b) What is matrix method of analysis? How it is used for analysis of spatial mechanisms? **[5]**

Q7) Explain the following with neat sketches : **[10]**

a) Dyad.

b) Center point.

c) Circle point.

d) Ground pivot specifications.

e) Cognates.